ECDIS

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What is ECDIS?

The Electronic Chart Display and Information System (ECDIS) is an electronic navigational system. Where it is accompanied with adequate back up arrangements it can be accepted as complying with the up to date chart carriage requirement of Chapter V of the SOLAS convention. This means it may be used as the primary means of navigation.

In order to qualify as the primary means of navigation, the equipment must be type approved and certified by the relevant flag state as complying with the IMO Performance Standard for ECDIS.

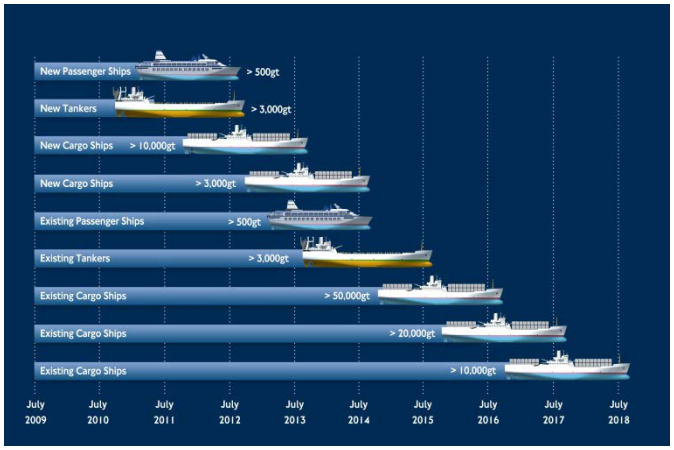
Any system that has not undergone type approval and certification is known as an Electronic Chart System (ECS). This equipment can be used as an aid to navigation but is not suitable for use as the primary means of navigation.

A copy of the IMO Performance standards for ECDIS can be found at the following links, Resolution A.817 (19) and Resolution MSC.232(82).

This briefing is the first in a series of loss prevention publications relating to ECDIS. It focuses on some of the basics relating to the operation and use of ECDIS on board.

ECDIS Implementation

The mandatory requirement for ECDIS to be fitted commenced in 2012. This was done on a rolling basis depending on the size and type of vessel. All passenger vessels over 500gt and tankers over 3,000gt will now be fitted with ECDIS. The final vessels to be fitted with ECDIS will be existing cargo vessels greater than 20,000gt (to be fitted by July 2017) and existing cargo vessels greater than 10,000gt (to be fitted by July 2018).



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The effective integration of ECDIS onboard, and the safe transition from paper chart navigation to ECDIS navigation, will require detailed planning. This planning should include:

- A structured risk assessment of the potential hazards of electronic navigation.
- Identification of training requirements.
- A thorough review of navigational procedures contained within the Safety Management System.

The following are some of the key points to be considered:

- Choice of ECDIS manufacturer / model and whether a single make and model will be fitted across the fleet.
- ECDIS hardware and software service and maintenance requirements and agreements.
- Backup arrangements.
- Whether ECDIS will be used as primary means of navigation or an aid to navigation.
- Contingency planning.
- Training program and schedule.
- Choice of chart management system across the fleet
- Choice of chart distributor.
- ENC chart availability in relation to trading pattern.
- Alternative charting options should ENC charts be unavailable.
- Safety setting requirements.
- Voyage planning requirements.
- Voyage monitoring requirements.
- ECDIS data transfer requirements.

A structured and detailed plan should ensure a safe and smooth transition from paper based navigation to electronic navigation.

Training

The Manila amendments to the STCW Code entered into force on 1 January 2012. These require all navigational watchkeeping officers to have undergone ECDIS training if they are sailing on a vessel fitted with ECDIS. This training is required whether ECDIS is used as the primary means of navigation or as an aid to navigation. In order to ensure that the training requirements of the 2010 Manila amendments are met, formal ECDIS training will now also be included as a part of navigational watchkeeping officers Certificate of Competency training.

ECDIS training should be undertaken in two stages to ensure watchkeepers are fully able to understand and utilize the system. Generic training, usually conducted at a dedicated training centre. This will ensure that the watchkeeper fully understands the underlying principles of ECDIS and can meet the competencies outlined in the IMO model course. This training will not necessarily focus on a specific type of equipment.

Once the watchkeeper understands the principals of ECDIS, familiarisation with the specific equipment fitted onboard should be carried out prior to a navigational watch being undertaken. This training is known as 'Type Specific'. The method of familiarisation will depend on company procedures as there are a number of ways in which this can be conducted. However familiarisation should ensure the watchkeeper is:

- Familiar with the setup and functionality of the fitted equipment
- Familiar with the backup arrangements
- Understands and can demonstrate implementation of the company procedures regarding electronic navigation

Navigational Charts

There are two types of electronic navigational chart available for use in an ECDIS, the vector Electronic

Navigational Chart (ENC) and the Raster Navigational Chart (RNC). There are distinct differences in the information available and how this is presented to the navigator from each type of chart.

Raster charts are digitized images of traditional paper charts that have been produced under the authority of a national hydrographic office.

The scanned image creates a passive chart which cannot be interrogated by the ECDIS for additional information. Individual elements and information cannot be modified and will suffer from distortion when zooming in on the chart area. Since the data presented on a raster chart cannot be interrogated, a number of the features and functions associated with ECDIS will not be available, (such as the automatic anti-grounding alarm).

Whilst automatic alarms cannot be triggered when using raster charts, the system can generate some alarms based on user entered information, these may include:

- Clearing lines.
- Ship safety contour lines.
- Isolated dangers.
- Danger areas.

Care must be taken when using raster charts to determine whether the original chart, on which the RNC is based, was surveyed using the WGS84 datum. This is the datum used by electronic position fixing systems such as GPS. If the original paper chart was not surveyed using the WGS84 datum then a suitable datum offset correction may need to be applied to the position fixing system. Care should also be taken to ensure that the navigator is fully aware of the units used for depth measurements on the raster chart.

Raster charts should only be used in an ECDIS system when navigating in an area that is not covered by ENC's. However, it should be noted that the vessel's flag state may require the vessel to take additional measures to minimise the risks associated with the use of raster charts.

This may take a similar form to the risk assessment which the UK Maritime and Coastguard Agency require, a copy of the relevant Marine Guidance Note can be found here.

In order for the navigator to make full use of the functionality and available safety features of the ECDIS system, official ENC charts should be used.

ENC's are a digital database containing all of the chart information needed for safe navigation. As each object, point, line or area has its own information included into the database; this allows the navigator to interrogate data presented on the chart such as buoys, navigational marks and depth contours or soundings for additional information.

The ECDIS will also use the ENC data to trigger automatic warnings and alarms for the navigator. These navigational alarms can include identifying hazards such as:

- Shallow depth.
- Isolated dangers.
- Cross track error.
- Approaching waypoints.
- Anti-grounding alarms, provided that the vessel's echo sounder inputs into the ECDIS.

However, in order for the automatic alarms to function correctly accurate information will have to be input to the system. Alarm parameters will also have to be specified correctly for the vessels current condition and particular voyage.

This navigational information available from the ENC is created in layers i.e. display base, standard display and all other information. This allows the navigator to remove information that is not necessary for the current voyage / condition from the display. In order to prevent critical navigational information being removed from the display, all navigators should familiarize themselves with the data contained within each layer and how to restore all information to the screen. It is recommended that suitable procedures are developed to address the setup of ECDIS equipment prior to handing over the navigational watch with particular focus on the use of chart layers.

Care must also be taken to ensure that critical depth information is not removed from the display when operating in base or standard display modes as this may prevent anti-grounding alarms from being generated.

The navigational information available in each of the layers is as follows:

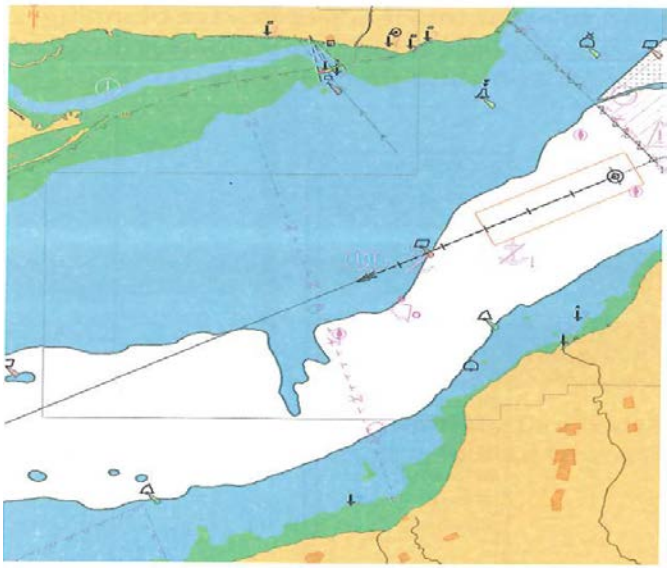
Base display to be permanently shown on the ECDIS display, consisting of:

- Coastline (high water).
- Own ship's safety contour.
- Isolated underwater dangers of depths less than the safety contour which lie within the safe waters defined by the safety contour.
- Isolated dangers which lie within the safe water defined by the safety contour, such as fixed structures, overhead wires, etc.
- Scale, range and north arrow;
- Units of depth and height; and

- Display mode.

Standard display consisting of:

- Display base.
- Drying line.
- Buoys, beacons, other aids to navigation and fixed structures.
- Boundaries of fairways, channels, etc.
- Visual and radar conspicuous features.
- Prohibited and restricted areas.
- Chart scale boundaries.
- Indication of cautionary notes.
- Ship routeing systems and ferry routes.
- Archipelagic sea lanes.



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All other information, to be displayed individually on demand, for example:

- Spot soundings.
- Submarine cables and pipelines.
- Details of all isolated dangers.
- Details of aids to navigation.
- Contents of cautionary notes.
- ENC edition date.
- Most recent chart update number.
- Magnetic variation.
- Graticule.
- Place names.

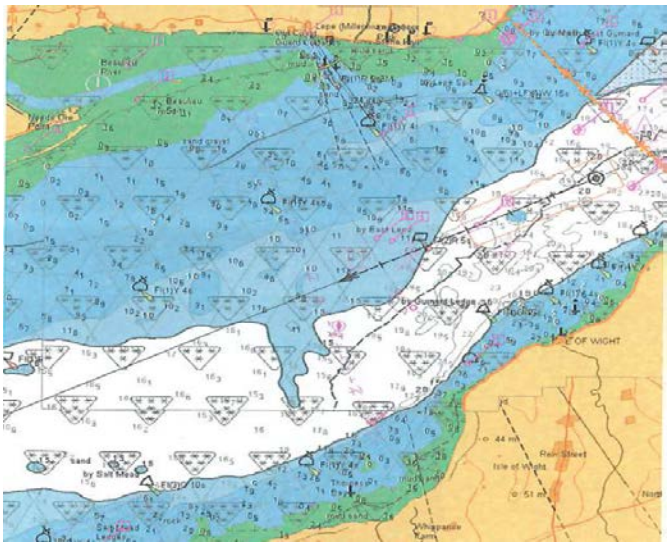

Image courtesy of the UKHO, source ADMIRALTY NP232

Only charts meeting the IHO ENC standards, produced under the authority of a national hydrographic office, should be used for navigation. Any other type of commercially produced electronic chart will not meet the chart carriage requirements of SOLAS.

Care should be taken to ensure that all navigators are fully familiar with the colours and symbols in use which can vary greatly from those used in traditional paper charts.

Operational Use of ECDIS

ECDIS is intended to improve navigational safety by reducing the workload of the navigator compared with navigation using paper charts. The system will enable efficient route planning and monitoring by providing the ability to automatically check the route against the pre-set safety parameters and through the interrogation of the data contained within the electronic chart.

In order to ensure that safe and effective route planning and monitoring is carried out, all navigators should be thoroughly familiar with the settings of the fitted ECDIS and understand the information displayed by the system. In order to ensure critical navigation functions are maintained in the event of an equipment failure, the current voyage plan should be copied to the backup system.

As the system continuously plots the ships position, the navigator is always aware of the vessel's current position. This ensures that navigational decisions are not based on historical position data. This allows the navigator to focus on the current situation around the vessel thus improving the overall situational awareness of the watchkeeper.

Whilst ECDIS can very accurately plot the vessels position, this is dependent on the positional information supplied to the system being accurate. It is therefore critical that position inputs are checked regularly to ensure they are functioning correctly. The position should be verified by other means where and when possible.

It may be possible for data from a number of other types of bridge equipment to be input into the ECDIS. However, care should be taken not to clutter the display or overload the watchkeeper with unnecessary information.

The IMO have produced a guide to good practice for ECDIS which can be found at the following link: MSC.1/Circ.1503.

ECDIS / ECS Incidents

Please follow this link for an extract from an ECDIS related accident report.

Further Guidance

Further guidance and information on ECDIS can be found in our LP Briefing – ECDIS – ENC Accuracy and our Hot-Spots – Voyage Planning With ECDIS.